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malguzar paid the sum of one rupee. The following morning he returned with the salutation, "Salaam, Huzur, my horse is better, I wish to get another dose of medicine." The next day he came with a beaming face, saying that his horse was able to stand, and could eat and drink. He brought his little eight-year-old daughter, who was suffering with a badly imbedded and infected tooth, which was easily removed and its cavity treated—an accomplishment thought to be very wonderful indeed! He was then exceedingly friendly and asked with great interest, "Who is this Christ of whom you are telling us?" He bought copies of all the books we had for sale and seemed as delighted as a child over a new toy. He then invited me to visit the women and children in his home. I accepted his invitation with alacrity, and was warmly received by the entire household. Thus through the ministration of a simple remedy to a sick horse I was privileged to serve the highest caste and most influential family in the village of Gotaura. The medical work was heavy—but interesting—yea verily.

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## HOOKWORM DISEASE—A PUBLIC HEALTH PROBLEM OF THE SOUTH

BY MARTHA M. GILTNER, R.N.

*Greenville, Mississippi*

*(Continued from page 807, July JOURNAL)*

**H**OOKWORM disease is recognized with certainty in two ways. If it is suspected from the clinical symptoms already described, treatment may be given. If the disease exists, the worms which cause it will be poisoned and dislodged by the medicine. They may be found by washing the stool through one or two thicknesses of cheese cloth. The worms if present will be left on the cloth and may be easily seen. The second method is by microscopical examination of the stool and finding the eggs and worms. This method is most generally used and is a positive method of diagnosis in any case.

In administering the treatment for this disease it is important to understand the conditions to be met with. There is no disease in which more wonderful improvement takes place after treatment than in severe cases. Even mild unsuspected cases often gain several pounds. Thymol was the drug most generally used until the war. As it is a German product the supply was low and more could not be secured, so *Chenopodium*, an American product, came into general use. It was found equally effective, much less disagreeable to take, and it has less unpleasant after effects. It is less expensive than

Thymol. Many other drugs have been given a trial and Beto-Naphthol has been found quite effective but has more unfavorable after effects; its use has therefore been limited to that of an experiment.

Hookworm disease is easy to prevent because its cause is known and it has no secondary host. "It does not go to man, man goes to it." Practically, it is the most difficult to prevent or eradicate because of its wide extent, intensity in favorable localities, enormous reproductive powers of adult worms, and rapid development of the ova to the infectious stage; another cause of difficulty depends upon the fact that the sources of infection, their number and danger result directly from careless, filthy habits.

The problems of prophylaxis in the prevention of reinfection after treatment are: stopping the danger of infection by exterminating the mature worms in the bodies of human beings and thus checking the supply of eggs at the source; preventing the growth and existence of larvae in the places where they develop; preventing the infection by larvae that have developed.

The first need is to stop it in those already infected. "Get the carriers." Have adequate sanitary organizations, secure periodic examinations of all the people living in a hookworm locality, examine all new comers, secure organization for educational work. The second need is to prevent soil infection by providing proper sewage, sanitary privies, and the universal wearing of good shoes. Prevention of infection by larvae is largely a matter of education. "Law is not the instrument best fitted to compel a man to be clean and live up to the rules of hygiene." Everyone living in a hookworm country should be taught the essential facts about hookworms and their effects.

As was stated early in this paper, no systematic investigations had been made up to 1910. It was largely through the reports made by Dr. Stiles that John D. Rockefeller became interested and appointed a private commission to make an independent study of the nature and prevalence of the disease in the rural districts of the South and to consider plans for the investigation of its evils. Studies were made in all the Southern states and infection found. After these investigations had been made and results reported, Mr. Rockefeller invited the commission to consider plans for a coöperative movement of the medical profession, Public Health officials, boards of trade, and other state and local interests for the cure and prevention of this disease. On October 26, 1909, this commission received authority from Mr. Rockefeller to call on him for sums needed to carry on a campaign up to the total of one million dollars. Mr. Wickliffe Rose was appointed administrative secretary; he was to conduct the work and carry out the policies as outlined by the executive committee.

The task as undertaken was to determine the geographical distribution, make a reliable estimate of the degree of infection for each infected area, to cure present sufferers, and finally to remove sources of infection by putting a stop to soil pollution. Each state was organized to carry on the work with a force of sanitary inspectors and laboratory staff. The object was to demonstrate to the people of the states that hookworm disease was a reality, that it was a serious handicap, that it was curable and preventable.

The work accomplished by this commission follows: Number of counties surveyed, 596; average number examined in each county, 921; number of children examined, 548,992; number of children infected, 216,828; per cent infected, 39%; sanitary surveys made for 653 counties; farm homes inspected, 250,680; found without privies, 125,584; average number of homes infected in each county, 383. Dispensary campaigns were conducted in 578 counties in eleven states; 1,087,666 persons were examined; 440,376 persons were treated. The expenses were partly borne by the counties.

Coöperation of the medical profession was secured. Instruction given in medical schools instituted. The press, although denying the existence of the disease at first, changed its attitude and contributed space for propaganda for its relief and control. Definite instruction on the subject of hookworm disease, its dangers and prevention of soil pollution was made a part of the school course in twelve states. Intensive work was being undertaken by communities and great work was accomplished in the development of state and local health service. The work was then turned over to the respective states which have continued it. Although the coming of the war greatly reduced the health activities, much that was started was carried on by the communities. A report secured from twenty-five manufacturing concerns shows a total of almost 30,000 sanitary appliances, representing a value of approximately \$700,000 sold from 1915 to 1917. This represents only a part of the voluntary expenses assumed by the people of those states over a short period of time in the effort to protect themselves from the dangers of soil pollution. As a result of improved sanitary conditions in various states similar reports are given, of which the following are from Virginia, where the State Health Commissioner attributes the results to the measures taken to prevent hookworm disease: Cases of typhoid in 1909, 14,400; cases of typhoid in 1917, 5,038, a reduction of 65 per cent. Taking this year by year, it represents a total of from 40,000 to 50,000 cases.

In nine counties in North Carolina from 1914 to 1917 the total number of deaths from typhoid averaged 119.5, or 35.3 per 100,000 population yearly. In 1918, as a result of a campaign against soil

pollution to prevent hookworm disease in the counties in which 6,480 sanitary privies were erected, statistics show that out of an aggregate population of 305,016 there were 24 deaths, or 7.8 per 100,000. Reports also show a reduction in diarrheal diseases and deaths among children to be even greater than in typhoid.

The State Board of Health of Mississippi has carried on an intensive campaign in some of its counties. In one county a "Sanitary Latrine Week" proved an effective method of achieving results in the building of latrines. Men were released by employers to stay at home and put up privies, and a spirit of competition was aroused that helped to speed the work.

An inquiry was made as to what service the Public Health Nurse may render in the eradication and prevention of hookworm disease, with the following responses from State Boards of Health: "There is no more important work to be done by the nurse in the rural and small town communities in the South than to bring to light cases of hookworm infection and to see that the patient gets the proper treatment. In many instances when the child is found infected the parents object to his being treated. In such instances the nurse is sent to the home to persuade the parents to administer the treatment or they may give their consent and she will give it."

The nurse aids greatly in the work by giving health talks to the children in the schools; also in teaching the principles of sanitation and prevention of soil pollution. These talks have been found invaluable in many instances, as the children carry the lessons into their homes and to their parents. In a report received from a nurse who is doing public health nursing in a county in Southern Georgia the following work was done within the past year: "On my visits to the country schools I secured and delivered to the laboratory so many specimens they were unable to make all the examinations. It was found that at least 90 per cent of all examined showed infection. The County Health Officer then gave me instructions to secure a history of those who had had ground itch and any other symptoms of the disease. Only specimens from doubtful cases were taken to the laboratory for examination." The Health Officer prescribed the treatments, which were given by the nurse because so many parents would not give it, saying it might make the child sick. Three treatments were necessary. The nurse went to the school once each week and gave treatments until all were given. Within the year this nurse had treated over one thousand cases out of sixteen hundred examined and reports remarkable improvement in the condition of the children within a few weeks after having the treatment.

In communities such as these the value of the service of the pub-

lic health nurse as a teacher of health principles is inestimable. Of the twenty-five millions of people living in the Southern States, seventy-two per cent live in the open country. Five to ten millions of them are numbered among the unreached people as far as adequate medical attention is concerned. Much can be done by a nurse through demonstrations, health talks, lectures and home visits to bring to these people wonderful lessons of health, hygiene and sanitation. Many nurses are needed not only to help carry on this most important work in the eradication and prevention of hookworm disease, but also to assist in bringing about a betterment of the educational and social conditions of this great rural population.

If a nurse plans to do Public Health nursing in the South it seems most important that she become familiar with the greatest menace to the health of its people; that she should know the symptoms of the disease in order at least to suspect the infection in the person needing treatment. She should become familiar with the methods of transmission and the problems of sanitation and prevention, the treatment and the dangers sometimes attending it. The evolution of simple hookworm posts into effective agencies for conserving public health has been one of the gratifying developments of this work.

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## APPLIED BACTERIOLOGY

### I. THE VALUE OF THE VIRULENCE TEST IN DIPHTHERIA

*By a Bacteriologist*

“**E**VERY blue slip has a story all its own!” the Bacteriologist said as Miss J., a county nurse, handed her a dozen information blanks with throat swabs attached. “These are twelve different versions of the same story—‘Diphtheria in a Christian Science family,’ ” answered the nurse. Following is the story the Bacteriologist found on the slips.

Swab No. 1 from throat of Sammy Jones, age 16, died 7 a. m., membrane present, no antitoxin given, sick three days. “Sammy